

## SEQUENCE LISTING

<110> Bachmann, Martin F  
Maurer, Patrik F  
  
<120> Hapten-Carrier Conjugates and Uses Thereof  
  
<130> 1700.0300001  
  
<150> US 60/396,575  
<151> 2002-07-18  
  
<160> 33  
  
<170> PatentIn version 3.2  
  
<210> 1  
<211> 185  
<212> PRT  
<213> Hepatitis B virus  
  
<400> 1

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Ser Phe Leu Pro Ser Asp Phe Phe Pro Ser Val Arg Asp Leu Leu Asp  
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Thr Ala Ser Ala Leu Tyr Arg Glu Ala Leu Glu Ser Pro Glu His Cys  
35 40 45

Ser Pro His His Thr Ala Leu Arg Gln Ala Ile Leu Cys Trp Gly Glu  
50 55 60

Leu Met Thr Leu Ala Thr Trp Val Gly Asn Asn Leu Glu Asp Pro Ala  
65 70 75 80

Ser Arg Asp Leu Val Val Asn Tyr Val Asn Thr Asn Met Gly Leu Lys  
85 90 95

Ile Arg Gln Leu Leu Trp Phe His Ile Ser Cys Leu Thr Phe Gly Arg  
100 105 110

Glu Thr Val Leu Glu Tyr Leu Val Ser Phe Gly Val Trp Ile Arg Thr  
115 120 125

Pro Pro Ala Tyr Arg Pro Pro Asn Ala Pro Ile Leu Ser Thr Leu Pro  
130 135 140

Glu Thr Thr Val Val Arg Arg Arg Asp Arg Gly Arg Ser Pro Arg Arg  
145 150 155 160

Arg Thr Pro Ser Pro Arg Arg Arg Arg Ser Gln Ser Pro Arg Arg Arg  
 165 170 175

Arg Ser Gln Ser Arg Glu Ser Gln Cys  
 180 185

<210> 2  
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 <213> Escherichia coli

<400> 2

Met Lys Ile Lys Thr Leu Ala Ile Val Val Leu Ser Ala Leu Ser Leu  
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 20 25 30

Val His Phe Lys Gly Glu Val Val Asn Ala Ala Cys Ala Val Asp Ala  
 35 40 45

Gly Ser Val Asp Gln Thr Val Gln Leu Gly Gln Val Arg Thr Ala Ser  
 50 55 60

Leu Ala Gln Glu Gly Ala Thr Ser Ser Ala Val Gly Phe Asn Ile Gln  
 65 70 75 80

Leu Asn Asp Cys Asp Thr Asn Val Ala Ser Lys Ala Ala Val Ala Phe  
 85 90 95

Leu Gly Thr Ala Ile Asp Ala Gly His Thr Asn Val Leu Ala Leu Gln  
 100 105 110

Ser Ser Ala Ala Gly Ser Ala Thr Asn Val Gly Val Gln Ile Leu Asp  
 115 120 125

Arg Thr Gly Ala Ala Leu Thr Leu Asp Gly Ala Thr Phe Ser Ser Glu  
 130 135 140

Thr Thr Leu Asn Asn Gly Thr Asn Thr Ile Pro Phe Gln Ala Arg Tyr  
 145 150 155 160

Phe Ala Thr Gly Ala Ala Thr Pro Gly Ala Ala Asn Ala Asp Ala Thr  
 165 170 175

Phe Lys Val Gln Tyr Gln  
180

<210> 3  
<211> 132  
<212> PRT  
<213> Bacteriophage Qbeta  
  
<400> 3

Ala Lys Leu Glu Thr Val Thr Leu Gly Asn Ile Gly Lys Asp Gly Lys  
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Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
20 25 30

Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
35 40 45

Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys Val  
50 55 60

Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser Cys  
65 70 75 80

Asp Pro Ser Val Thr Arg Gln Ala Tyr Ala Asp Val Thr Phe Ser Phe  
85 90 95

Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu Leu  
100 105 110

Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln Leu  
115 120 125

Asn Pro Ala Tyr  
130

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<211> 329  
<212> PRT  
<213> Bacteriophage Qbeta

<400> 4

Met Ala Lys Leu Glu Thr Val Thr Leu Gly Asn Ile Gly Lys Asp Gly  
1 5 10 15

Lys Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly  
20 25 30

Val Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg  
 35 40 45

Val Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys  
 50 55 60

Val Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser  
 65 70 75 80

Cys Asp Pro Ser Val Thr Arg Gln Ala Tyr Ala Asp Val Thr Phe Ser  
 85 90 95

Phe Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu  
 100 105 110

Leu Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln  
 115 120 125

Leu Asn Pro Ala Tyr Trp Thr Leu Leu Ile Ala Gly Gly Ser Gly  
 130 135 140

Ser Lys Pro Asp Pro Val Ile Pro Asp Pro Pro Ile Asp Pro Pro Pro  
 145 150 155 160

Gly Thr Gly Lys Tyr Thr Cys Pro Phe Ala Ile Trp Ser Leu Glu Glu  
 165 170 175

Val Tyr Glu Pro Pro Thr Lys Asn Arg Pro Trp Pro Ile Tyr Asn Ala  
 180 185 190

Val Glu Leu Gln Pro Arg Glu Phe Asp Val Ala Leu Lys Asp Leu Leu  
 195 200 205

Gly Asn Thr Lys Trp Arg Asp Trp Asp Ser Arg Leu Ser Tyr Thr Thr  
 210 215 220

Phe Arg Gly Cys Arg Gly Asn Gly Tyr Ile Asp Leu Asp Ala Thr Tyr  
 225 230 235 240

Leu Ala Thr Asp Gln Ala Met Arg Asp Gln Lys Tyr Asp Ile Arg Glu  
 245 250 255

Gly Lys Lys Pro Gly Ala Phe Gly Asn Ile Glu Arg Phe Ile Tyr Leu  
 260 265 270

Lys Ser Ile Asn Ala Tyr Cys Ser Leu Ser Asp Ile Ala Ala Tyr His  
 275 280 285

Ala Asp Gly Val Ile Val Gly Phe Trp Arg Asp Pro Ser Ser Gly Gly  
 290 295 300

Ala Ile Pro Phe Asp Phe Thr Lys Phe Asp Lys Thr Lys Cys Pro Ile  
 305 310 315 320

Gln Ala Val Ile Val Val Pro Arg Ala  
 325

<210> 5  
 <211> 28  
 <212> DNA  
 <213> Artificial Sequence

<220>  
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<220>  
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 <223> n can be any nucleotide, preferably a

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28

<210> 6  
 <211> 132  
 <212> PRT  
 <213> Artificial Sequence

<220>  
 <223> Bacteriophage Qbeta 240 mutant

<400> 6

Ala Lys Leu Glu Thr Val Thr Leu Gly Asn Ile Gly Arg Asp Gly Lys  
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Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
 20 25 30

Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
 35 40 45

Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys Val  
 50 55 60

Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser Cys

65

70

75

80

Asp Pro Ser Val Thr Arg Gln Lys Tyr Ala Asp Val Thr Phe Ser Phe  
 85 90 95

Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu Leu  
 100 105 110

Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln Leu  
 115 120 125

Asn Pro Ala Tyr  
 130

<210> 7  
<211> 132  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Bacteriophage Q-beta 243 mutant

<400> 7

Ala Lys Leu Glu Thr Val Thr Leu Gly Lys Ile Gly Lys Asp Gly Lys  
 1 5 10 15

Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
 20 25 30

Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
 35 40 45

Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys Val  
 50 55 60

Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser Cys  
 65 70 75 80

Asp Pro Ser Val Thr Arg Gln Lys Tyr Ala Asp Val Thr Phe Ser Phe  
 85 90 95

Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu Leu  
 100 105 110

Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln Leu  
 115 120 125

Asn Pro Ala Tyr  
130

<210> 8  
<211> 132  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Bacteriophage Q-beta 250 mutant

<400> 8

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Gln	Thr	Leu	Val	Leu	Asn	Pro	Arg	Gly	Val	Asn	Pro	Thr	Asn	Gly	Val
									25				30		

Ala	Ser	Leu	Ser	Gln	Ala	Gly	Ala	Val	Pro	Ala	Leu	Glu	Lys	Arg	Val
									35			40		45	

Thr	Val	Ser	Val	Ser	Gln	Pro	Ser	Arg	Asn	Arg	Lys	Asn	Tyr	Lys	Val
									50		55		60		

Gln	Val	Lys	Ile	Gln	Asn	Pro	Thr	Ala	Cys	Thr	Ala	Asn	Gly	Ser	Cys
									65		70		75		80

Asp	Pro	Ser	Val	Thr	Arg	Gln	Lys	Tyr	Ala	Asp	Val	Thr	Phe	Ser	Phe
									85		90		95		

Thr	Gln	Tyr	Ser	Thr	Asp	Glu	Glu	Arg	Ala	Phe	Val	Arg	Thr	Glu	Leu
									100		105		110		

Ala	Ala	Leu	Leu	Ala	Ser	Pro	Leu	Leu	Ile	Asp	Ala	Ile	Asp	Gln	Leu
									115		120		125		

Asn Pro Ala Tyr  
130

<210> 9  
<211> 132  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Bacteriophage Q-beta 251 mutant

<400> 9

Ala Lys Leu Glu Thr Val Thr Leu Gly Asn Ile Gly Lys Asp Gly Arg

1

5

10

15

Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
 20 25 30

Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
 35 40 45

Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys Val  
 50 55 60

Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser Cys  
 65 70 75 80

Asp Pro Ser Val Thr Arg Gln Lys Tyr Ala Asp Val Thr Phe Ser Phe  
 85 90 95

Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu Leu  
 100 105 110

Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln Leu  
 115 120 125

Asn Pro Ala Tyr  
 130

<210> 10  
<211> 132  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> Bacteriophage Q-beta 259 mutant

<400> 10

Ala Arg Leu Glu Thr Val Thr Leu Gly Asn Ile Gly Lys Asp Gly Arg  
 1 5 10 15

Gln Thr Leu Val Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
 20 25 30

Ala Ser Leu Ser Gln Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
 35 40 45

Thr Val Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys Val  
 50 55 60

Gln Val Lys Ile Gln Asn Pro Thr Ala Cys Thr Ala Asn Gly Ser Cys  
 65                    70                    75                    80

Asp Pro Ser Val Thr Arg Gln Lys Tyr Ala Asp Val Thr Phe Ser Phe  
 85                    90                    95

Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Phe Val Arg Thr Glu Leu  
 100                    105                    110

Ala Ala Leu Leu Ala Ser Pro Leu Leu Ile Asp Ala Ile Asp Gln Leu  
 115                    120                    125

Asn Pro Ala Tyr  
 130

<210> 11  
<211> 5  
<212> PRT  
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<220>  
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<400> 11

Gly Gly Lys Gly Gly  
 1                    5

<210> 12  
<211> 49  
<212> PRT  
<213> Artificial Sequence

<220>  
<223> GCN4

<400> 12

Pro Ala Ala Leu Lys Arg Ala Arg Asn Glu Ala Ala Arg Arg Ser Arg  
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Ala Arg Lys Leu Gln Arg Met Lys Gln Leu Glu Asp Lys Val Glu Glu  
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Leu Leu Ser Lys Asn Tyr His Leu Glu Asn Glu Val Ala Arg Leu Lys  
 35                    40                    45

Lys

<210> 13

<211> 128  
<212> PRT  
<213> Bacteriophage PP7

<400> 13

Met Ser Lys Thr Ile Val Leu Ser Val Gly Glu Ala Thr Arg Thr Leu  
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Thr Glu Ile Gln Ser Thr Ala Asp Arg Gln Ile Phe Glu Glu Lys Val  
20 25 30

Gly Pro Leu Val Gly Arg Leu Arg Leu Thr Ala Ser Leu Arg Gln Asn  
35 40 45

Gly Ala Lys Thr Ala Tyr Arg Val Asn Leu Lys Leu Asp Gln Ala Asp  
50 55 60

Val Val Asp Cys Ser Thr Ser Val Cys Gly Glu Leu Pro Lys Val Arg  
65 70 75 80

Tyr Thr Gln Val Trp Ser His Asp Val Thr Ile Val Ala Asn Ser Thr  
85 90 95

Glu Ala Ser Arg Lys Ser Leu Tyr Asp Leu Thr Lys Ser Leu Val Ala  
100 105 110

Thr Ser Gln Val Glu Asp Leu Val Val Asn Leu Val Pro Leu Gly Arg  
115 120 125

<210> 14  
<211> 131  
<212> PRT  
<213> Bacteriophage AP205

<400> 14

Met Ala Asn Lys Pro Met Gln Pro Ile Thr Ser Thr Ala Asn Lys Ile  
1 5 10 15

Val Trp Ser Asp Pro Thr Arg Leu Ser Thr Thr Phe Ser Ala Ser Leu  
20 25 30

Leu Arg Gln Arg Val Lys Val Gly Ile Ala Glu Leu Asn Asn Val Ser  
35 40 45

Gly Gln Tyr Val Ser Val Tyr Lys Arg Pro Ala Pro Lys Pro Glu Gly  
50 55 60

Cys Ala Asp Ala Cys Val Ile Met Pro Asn Glu Asn Gln Ser Ile Arg  
 65                    70                    75                    80

Thr Val Ile Ser Gly Ser Ala Glu Asn Leu Ala Thr Leu Lys Ala Glu  
 85                    90                    95

Trp Glu Thr His Lys Arg Asn Val Asp Thr Leu Phe Ala Ser Gly Asn  
 100                    105                    110

Ala Gly Leu Gly Phe Leu Asp Pro Thr Ala Ala Ile Val Ser Ser Asp  
 115                    120                    125

Thr Thr Ala  
 130

<210> 15  
<211> 3635  
<212> DNA  
<213> Artificial Sequence

<220>

<223> Plasmid, pAP283-58, encoding RNA phage AP205 coat protein

<400> 15

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ggaaaatcac atggcaaata agccaatgca accgatcaca tctacagcaa ataaaattgt	180
gtggtcggat ccaactcggt tatcaactac atttcagca agtctgttac gccaacgtgt	240
taaaagggtt atagccgaac tgaataatgt ttcaggtcaa tatgtatctg tttataagcg	300
tcctgcacct aaaccggaag gttgtgcaga tgcctgtgtc attatgccga atgaaaacca	360
atccattcgc acagtgattt cagggtcagc cgaaaacttg gctacctaa aagcagaatg	420
ggaaaactcac aaacgtaacg ttgacacact cttcgcgagc ggcaacgccc gtttgggttt	480
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taacgacaat atgtacaagc ctaattgtgt agcatctggc ttactgaagc agaccctatc	660
atctctctcg taaactgccc tcagagtcgg tttgggttggc cgaaccttct gagttctgg	720
taacgccgtt ccgcaccccg gaaatggtca ccgaaccaat cagcagggtc atcgctagcc	780
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gcccctatat cggccacatc accgatgggg aagatcgggc tcgcccacttc gggctcatga	900
cgcttgggtt cggcgtgggt atggtggcag gccccgtggc cgggggactg ttggggcgcca	960

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acttcaagaa ctctgttagca ccgcctacat acctcgctct gctaattcctg ttaccagtgg 2760  
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ataaggcgca	gcggtcgggc	tgaacggggg	gttcgtgcac	acagcccagc	ttggagcgaa	2880
cgacctacac	cgaactgaga	tacctacagc	gcgagcattg	agaaagcgcc	acgcttccc	2940
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gggagcttcc	agggggaaac	gcctggtatac	tttatagtcc	tgtcgggtt	cgccacctct	3060
gactttagcg	tcgattttg	tgatgctcgt	cagggggcg	gagcctatgg	aaaaacgcca	3120
gcaacgcggc	cttttacgg	ttcctggcct	tttgctggcc	tttgctcac	atgttcttcc	3180
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ttcgtgtcgc	tcaaggcgca	ctcccggtct	ggataatgtt	tttgcgccg	acatcataaac	3540
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<210>	16					
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<223>	putative AP205 ribosomal binding site of plasmid pAP283-58					
<400>	16					
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<210>	17					
<211>	35					
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<220>						
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<400>	17					
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<210>	18
<211>	131
<212>	PRT
<213>	Artificial Sequence
<220>	
<223>	Bacteriophage AP205 mutant

&lt;400&gt; 18

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Val	Trp	Ser	Asp	Pro	Thr	Arg	Leu	Ser	Thr	Thr	Phe	Ser	Ala	Ser	Leu
								25					30		

Leu	Arg	Gln	Arg	Val	Lys	Val	Gly	Ile	Ala	Glu	Leu	Asn	Asn	Val	Ser
					35		40					45			

Gly	Gln	Tyr	Val	Ser	Val	Tyr	Lys	Arg	Pro	Ala	Pro	Lys	Pro	Glu	Gly
					50		55				60				

Cys	Ala	Asp	Ala	Cys	Val	Ile	Met	Pro	Asn	Glu	Asn	Gln	Ser	Ile	Arg
65					70				75			80			

Thr	Val	Ile	Ser	Gly	Ser	Ala	Glu	Asn	Leu	Ala	Thr	Leu	Lys	Ala	Glu
					85			90				95			

Trp	Glu	Thr	His	Lys	Arg	Asn	Val	Asp	Thr	Leu	Phe	Ala	Ser	Gly	Asn
							100	105				110			

Ala	Gly	Leu	Gly	Phe	Leu	Asp	Pro	Thr	Ala	Ala	Ile	Val	Ser	Ser	Asp
					115		120				125				

Thr	Thr	Ala
	130	

<210>	19
<211>	3613
<212>	DNA
<213>	Artificial Sequence

&lt;220&gt;

&lt;223&gt; Plasmid, pAP281-32, encoding RNA phage AP205 coat protein

&lt;400&gt; 19

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acaatgcaac	cgatcacatc	tacagcaa	aaaattgtgt	ggtcggatcc	aactcgttta	180
tcaactacat	tttcagcaag	tctgttacgc	caacgtgttta	aagttggtat	agccgaactg	240
aataatgttt	caggtcaata	tgtatctgtt	tataagcgtc	ctgcaccaa	accggaaggt	300
tgtgcagatg	cctgtgtcat	tatgccaat	aaaaaccaat	ccattcgcac	agtgatttca	360
gggtcagccg	aaaacttggc	tacctaaaaa	gcagaatggg	aaactcacaa	acgtaacgtt	420

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atgatacata aggttatgtt ttaattgttag ccgcgttcta acgacaatat gtacaaggct	600
aattgtgttag catctggctt actgaagcag accctatcat ctctctcgta aactgccgtc	660
agagtcggtt tggttggacg aaccttctga gtttctggta acgcccgttcc gcaccccgga	720
aatggtcacc gaaccaatca gcagggtcat cgctagccag atcctctacg ccggacgcac	780
cgtggccggc atcacccggcg ccacaggtgc ggttgctggc gcctatatacg ccgacatcac	840
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ggtggcaggc cccgtggccg gggactgtt gggcgccatc tccttgcattt caccattcct	960
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ttaagccaac tccgctatcg ctacgtgact gggcatggc tgccgcggc cacccgc	1140
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cataccaaac gacgagcgtg acaccacgtt gcctgttagca atggcaacaa cgttgcgcac	2040
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cccgttctgg ataatgttt ttgcgccgac atcataacgg ttctggaaa tattctgaaa	3540
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<220>  
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<220>  
 <221> misc\_feature  
 <222> (1)..(2)

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<223> n can be any nucleotide, preferably a
<400> 20
nntctagaat tttctgcgca cccatccgg 30

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<211> 31
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<220>
<223> p1.46 primer

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<400> 21
nnaagcttaa gcagtagtat cagacgatac g 31

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<212> DNA
<213> Artificial Sequence

<220>
<223> p1.47 primer

<400> 22
gagtgatcca actcgtttat caactacatt ttcagcaagt ctg 43

<210> 23
<211> 43
<212> DNA
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<220>
<223> p1.48 primer

<400> 23
cagacttgct gaaaatgtag ttgataaaacg agttggatca ctc 43

<210> 24
<211> 129
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<213> Bacteriophage R17

<400> 24

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1 5 10 15

Asn Val Thr Val Ala Pro Ser Asn Phe Ala Asn Gly Val Ala Glu Trp
20 25 30

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Ile Ser Ser Asn Ser Arg Ser Gln Ala Tyr Lys Val Thr Cys Ser Val  
 35                          40                          45

Arg Gln Ser Ser Ala Gln Asn Arg Lys Tyr Thr Ile Lys Val Glu Val  
 50                          55                          60

Pro Lys Val Ala Thr Gln Thr Val Gly Gly Val Glu Leu Pro Val Ala  
 65                          70                          75                          80

Ala Trp Arg Ser Tyr Leu Asn Met Glu Leu Thr Ile Pro Ile Phe Ala  
 85                          90                          95

Thr Asn Ser Asp Cys Glu Leu Ile Val Lys Ala Met Gln Gly Leu Leu  
 100                        105                        110

Lys Asp Gly Asn Pro Ile Pro Ser Ala Ile Ala Ala Asn Ser Gly Ile  
 115                        120                        125

Tyr

<210> 25  
<211> 130  
<212> PRT  
<213> Bacteriophage fr

<400> 25

Met Ala Ser Asn Phe Glu Glu Phe Val Leu Val Asp Asn Gly Gly Thr  
 1                        5                        10                        15

Gly Asp Val Lys Val Ala Pro Ser Asn Phe Ala Asn Gly Val Ala Glu  
 20                        25                        30

Trp Ile Ser Ser Asn Ser Arg Ser Gln Ala Tyr Lys Val Thr Cys Ser  
 35                        40                        45

Val Arg Gln Ser Ser Ala Asn Asn Arg Lys Tyr Thr Val Lys Val Glu  
 50                        55                        60

Val Pro Lys Val Ala Thr Gln Val Gln Gly Gly Val Glu Leu Pro Val  
 65                        70                        75                        80

Ala Ala Trp Arg Ser Tyr Met Asn Met Glu Leu Thr Ile Pro Val Phe  
 85                        90                        95

Ala Thr Asn Asp Asp Cys Ala Leu Ile Val Lys Ala Leu Gln Gly Thr  
 100 105 110

Phe Lys Thr Gly Asn Pro Ile Ala Thr Ala Ile Ala Asn Ser Gly  
 115 120 125

Ile Tyr  
 130

<210> 26  
<211> 130  
<212> PRT  
<213> Bacteriophage GA

<400> 26

Met Ala Thr Leu Arg Ser Phe Val Leu Val Asp Asn Gly Gly Thr Gly  
 1 5 10 15

Asn Val Thr Val Val Pro Val Ser Asn Ala Asn Gly Val Ala Glu Trp  
 20 25 30

Leu Ser Asn Asn Ser Arg Ser Gln Ala Tyr Arg Val Thr Ala Ser Tyr  
 35 40 45

Arg Ala Ser Gly Ala Asp Lys Arg Lys Tyr Ala Ile Lys Leu Glu Val  
 50 55 60

Pro Lys Ile Val Thr Gln Val Val Asn Gly Val Glu Leu Pro Gly Ser  
 65 70 75 80

Ala Trp Lys Ala Tyr Ala Ser Ile Asp Leu Thr Ile Pro Ile Phe Ala  
 85 90 95

Ala Thr Asp Asp Val Thr Val Ile Ser Lys Ser Leu Ala Gly Leu Phe  
 100 105 110

Lys Val Gly Asn Pro Ile Ala Glu Ala Ile Ser Ser Gln Ser Gly Phe  
 115 120 125

Tyr Ala  
 130

<210> 27  
<211> 132  
<212> PRT  
<213> Bacteriophage SP

<400> 27

Met Ala Lys Leu Asn Gln Val Thr Leu Ser Lys Ile Gly Lys Asn Gly  
 1 5 10 15

Asp Gln Thr Leu Thr Leu Thr Pro Arg Gly Val Asn Pro Thr Asn Gly  
 20 25 30

Val Ala Ser Leu Ser Glu Ala Gly Ala Val Pro Ala Leu Glu Lys Arg  
 35 40 45

Val Thr Val Ser Val Ala Gln Pro Ser Arg Asn Arg Lys Asn Phe Lys  
 50 55 60

Val Gln Ile Lys Leu Gln Asn Pro Thr Ala Cys Thr Arg Asp Ala Cys  
 65 70 75 80

Asp Pro Ser Val Thr Arg Ser Ala Phe Ala Asp Val Thr Leu Ser Phe  
 85 90 95

Thr Ser Tyr Ser Thr Asp Glu Glu Arg Ala Leu Ile Arg Thr Glu Leu  
 100 105 110

Ala Ala Leu Leu Ala Asp Pro Leu Ile Val Asp Ala Ile Asp Asn Leu  
 115 120 125

Asn Pro Ala Tyr  
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<210> 28  
 <211> 329  
 <212> PRT  
 <213> Bacteriophage SP

<400> 28

Ala Lys Leu Asn Gln Val Thr Leu Ser Lys Ile Gly Lys Asn Gly Asp  
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Gln Thr Leu Thr Leu Thr Pro Arg Gly Val Asn Pro Thr Asn Gly Val  
 20 25 30

Ala Ser Leu Ser Glu Ala Gly Ala Val Pro Ala Leu Glu Lys Arg Val  
 35 40 45

Thr Val Ser Val Ala Gln Pro Ser Arg Asn Arg Lys Asn Phe Lys Val  
 50 55 60

Gln Ile Lys Leu Gln Asn Pro Thr Ala Cys Thr Arg Asp Ala Cys Asp

65

70

75

80

Pro Ser Val Thr Arg Ser Ala Phe Ala Asp Val Thr Leu Ser Phe Thr  
 85 90 95

Ser Tyr Ser Thr Asp Glu Glu Arg Ala Leu Ile Arg Thr Glu Leu Ala  
 100 105 110

Ala Leu Leu Ala Asp Pro Leu Ile Val Asp Ala Ile Asp Asn Leu Asn  
 115 120 125

Pro Ala Tyr Trp Ala Ala Leu Leu Val Ala Ser Ser Gly Gly Asp  
 130 135 140

Asn Pro Ser Asp Pro Asp Val Pro Val Val Pro Asp Val Lys Pro Pro  
 145 150 155 160

Asp Gly Thr Gly Arg Tyr Lys Cys Pro Phe Ala Cys Tyr Arg Leu Gly  
 165 170 175

Ser Ile Tyr Glu Val Gly Lys Glu Gly Ser Pro Asp Ile Tyr Glu Arg  
 180 185 190

Gly Asp Glu Val Ser Val Thr Phe Asp Tyr Ala Leu Glu Asp Phe Leu  
 195 200 205

Gly Asn Thr Asn Trp Arg Asn Trp Asp Gln Arg Leu Ser Asp Tyr Asp  
 210 215 220

Ile Ala Asn Arg Arg Cys Arg Gly Asn Gly Tyr Ile Asp Leu Asp  
 225 230 235 240

Ala Thr Ala Met Gln Ser Asp Asp Phe Val Leu Ser Gly Arg Tyr Gly  
 245 250 255

Val Arg Lys Val Lys Phe Pro Gly Ala Phe Gly Ser Ile Lys Tyr Leu  
 260 265 270

Leu Asn Ile Gln Gly Asp Ala Trp Leu Asp Leu Ser Glu Val Thr Ala  
 275 280 285

Tyr Arg Ser Tyr Gly Met Val Ile Gly Phe Trp Thr Asp Ser Lys Ser  
 290 295 300

Pro Gln Leu Pro Thr Asp Phe Thr Gln Phe Asn Ser Ala Asn Cys Pro  
 305 310 315 320

Val Gln Thr Val Ile Ile Ile Pro Ser  
325

<210> 29  
<211> 130  
<212> PRT  
<213> Bacteriophage MS2

<400> 29

Met Ala Ser Asn Phe Thr Gln Phe Val Leu Val Asp Asn Gly Gly Thr  
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Gly Asp Val Thr Val Ala Pro Ser Asn Phe Ala Asn Gly Val Ala Glu  
20 25 30

Trp Ile Ser Ser Asn Ser Arg Ser Gln Ala Tyr Lys Val Thr Cys Ser  
35 40 45

Val Arg Gln Ser Ser Ala Gln Asn Arg Lys Tyr Thr Ile Lys Val Glu  
50 55 60

Val Pro Lys Val Ala Thr Gln Thr Val Gly Gly Val Glu Leu Pro Val  
65 70 75 80

Ala Ala Trp Arg Ser Tyr Leu Asn Met Glu Leu Thr Ile Pro Ile Phe  
85 90 95

Ala Thr Asn Ser Asp Cys Glu Leu Ile Val Lys Ala Met Gln Gly Leu  
100 105 110

Leu Lys Asp Gly Asn Pro Ile Pro Ser Ala Ile Ala Ala Asn Ser Gly  
115 120 125

Ile Tyr  
130

<210> 30  
<211> 133  
<212> PRT  
<213> Bacteriophage M11

<400> 30

Met Ala Lys Leu Gln Ala Ile Thr Leu Ser Gly Ile Gly Lys Lys Gly  
1 5 10 15

Asp Val Thr Leu Asp Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly

20

25

30

Val Ala Ala Leu Ser Glu Ala Gly Ala Val Pro Ala Leu Glu Lys Arg  
 35                   40                   45

Val Thr Ile Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys  
 50                   55                   60

Val Gln Val Lys Ile Gln Asn Pro Thr Ser Cys Thr Ala Ser Gly Thr  
 65                   70                   75                   80

Cys Asp Pro Ser Val Thr Arg Ser Ala Tyr Ser Asp Val Thr Phe Ser  
 85                   90                   95

Phe Thr Gln Tyr Ser Thr Val Glu Glu Arg Ala Leu Val Arg Thr Glu  
 100                105                110

Leu Gln Ala Leu Leu Ala Asp Pro Met Leu Val Asn Ala Ile Asp Asn  
 115                120                125

Leu Asn Pro Ala Tyr  
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<210> 31  
<211> 133  
<212> PRT  
<213> Bacteriophage MX1

<400> 31

Met Ala Lys Leu Gln Ala Ile Thr Leu Ser Gly Ile Gly Lys Asn Gly  
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Asp Val Thr Leu Asn Leu Asn Pro Arg Gly Val Asn Pro Thr Asn Gly  
 20                25                   30

Val Ala Ala Leu Ser Glu Ala Gly Ala Val Pro Ala Leu Glu Lys Arg  
 35                40                   45

Val Thr Ile Ser Val Ser Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys  
 50                55                   60

Val Gln Val Lys Ile Gln Asn Pro Thr Ser Cys Thr Ala Ser Gly Thr  
 65                70                   75                   80

Cys Asp Pro Ser Val Thr Arg Ser Ala Tyr Ala Asp Val Thr Phe Ser  
 85                90                   95

Phe Thr Gln Tyr Ser Thr Asp Glu Glu Arg Ala Leu Val Arg Thr Glu  
 100 105 110

Leu Lys Ala Leu Leu Ala Asp Pro Met Leu Ile Asp Ala Ile Asp Asn  
 115 120 125

Leu Asn Pro Ala Tyr  
 130

<210> 32  
<211> 330  
<212> PRT  
<213> Bacteriophage NL95

<400> 32

Met Ala Lys Leu Asn Lys Val Thr Leu Thr Gly Ile Gly Lys Ala Gly  
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Asn Gln Thr Leu Thr Leu Thr Pro Arg Gly Val Asn Pro Thr Asn Gly  
 20 25 30

Val Ala Ser Leu Ser Glu Ala Gly Ala Val Pro Ala Leu Glu Lys Arg  
 35 40 45

Val Thr Val Ser Val Ala Gln Pro Ser Arg Asn Arg Lys Asn Tyr Lys  
 50 55 60

Val Gln Ile Lys Leu Gln Asn Pro Thr Ala Cys Thr Lys Asp Ala Cys  
 65 70 75 80

Asp Pro Ser Val Thr Arg Ser Gly Ser Arg Asp Val Thr Leu Ser Phe  
 85 90 95

Thr Ser Tyr Ser Thr Glu Arg Glu Ala Leu Ile Arg Thr Glu Leu  
 100 105 110

Ala Ala Leu Leu Lys Asp Asp Leu Ile Val Asp Ala Ile Asp Asn Leu  
 115 120 125

Asn Pro Ala Tyr Trp Ala Ala Leu Leu Ala Ala Ser Pro Gly Gly Gly  
 130 135 140

Asn Asn Pro Tyr Pro Gly Val Pro Asp Ser Pro Asn Val Lys Pro Pro  
 145 150 155 160

Gly Gly Thr Gly Thr Tyr Arg Cys Pro Phe Ala Cys Tyr Arg Arg Gly

165

170

175

Glu Leu Ile Thr Glu Ala Lys Asp Gly Ala Cys Ala Leu Tyr Ala Cys  
 180 185 190

Gly Ser Glu Ala Leu Val Glu Phe Glu Tyr Ala Leu Glu Asp Phe Leu  
 195 200 205

Gly Asn Glu Phe Trp Arg Asn Trp Asp Gly Arg Leu Ser Lys Tyr Asp  
 210 215 220

Ile Glu Thr His Arg Arg Cys Arg Gly Asn Gly Tyr Val Asp Leu Asp  
 225 230 235 240

Ala Ser Val Met Gln Ser Asp Glu Tyr Val Leu Ser Gly Ala Tyr Asp  
 245 250 255

Val Val Lys Met Gln Pro Pro Gly Thr Phe Asp Ser Pro Arg Tyr Tyr  
 260 265 270

Leu His Leu Met Asp Gly Ile Tyr Val Asp Leu Ala Glu Val Thr Ala  
 275 280 285

Tyr Arg Ser Tyr Gly Met Val Ile Gly Phe Trp Thr Asp Ser Lys Ser  
 290 295 300

Pro Gln Leu Pro Thr Asp Phe Thr Arg Phe Asn Arg His Asn Cys Pro  
 305 310 315 320

Val Gln Thr Val Ile Val Ile Pro Ser Leu  
 325 330

<210> 33  
 <211> 129  
 <212> PRT  
 <213> Bacteriophage f2

<400> 33

Ala Ser Asn Phe Thr Gln Phe Val Leu Val Asn Asp Gly Gly Thr Gly  
 1 5 10 15

Asn Val Thr Val Ala Pro Ser Asn Phe Ala Asn Gly Val Ala Glu Trp  
 20 25 30

Ile Ser Ser Asn Ser Arg Ser Gln Ala Tyr Lys Val Thr Cys Ser Val  
 35 40 45

Arg Gln Ser Ser Ala Gln Asn Arg Lys Tyr Thr Ile Lys Val Glu Val  
50 55 60

Pro Lys Val Ala Thr Gln Thr Val Gly Gly Val Glu Leu Pro Val Ala  
65 70 75 80

Ala Trp Arg Ser Tyr Leu Asn Leu Glu Leu Thr Ile Pro Ile Phe Ala  
85 90 95

Thr Asn Ser Asp Cys Glu Leu Ile Val Lys Ala Met Gln Gly Leu Leu  
100 105 110

Lys Asp Gly Asn Pro Ile Pro Ser Ala Ile Ala Ala Asn Ser Gly Ile  
115 120 125

Tyr